Small Business Innovation Research/Small Business Tech Transfer

GaAs Schottky Diode Technology for Terahertz Harmonic Mixers, Phase I

Completed Technology Project (2018 - 2019)

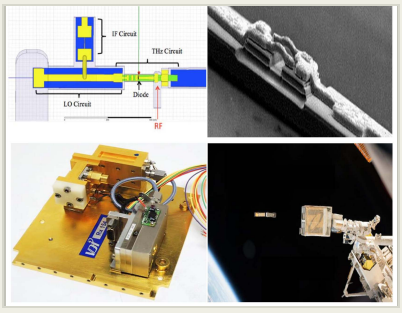
Project Introduction

This proposal is responsive to NASA SBIR Subtopic S1.03: Technologies for Passive Microwave Remote Sensing; specifically the last bullet item related to GaAs Schottky diode harmonic mixers for the 2-5 THz frequency band. Through this proposed SBIR project, VDI seeks to extend the performance of high-quality harmonic mixers to frequencies up to 5 THz; with the primary goal of meeting the requirements of planned and future NASA missions. This effort will focus primarily on second and fourth harmonic mixers which will use advanced circuit designs and fabrication technologies to maintain low conversion loss while also reducing the complexity of the local oscillator source.

Anticipated Benefits

The primary applications will be studies of planetary atmospheres, heliophysics and radio astronomy. Of particular importance is the study of water chemistry on planets and moons. Many of the molecules related to water chemistry have transitions in the frequency band that will be accessed by the new mixers. For radio astronomy, the harmonic mixers will be used to phase lock QCLs, which are becoming the technology of choice to supply the LO power for ultra-sensitive cryogenic receivers.

This research will open a new spectral band for more practical scientific exploitation. Scientific fields that require high quality THz mixers include nuclear fusion plasma diagnostics, molecular spectroscopy, environmental sensing, materials characterization and basic physics. More commercial applications will include the extension of the frequency range of test and measurement, such as vector network and signal analysis.



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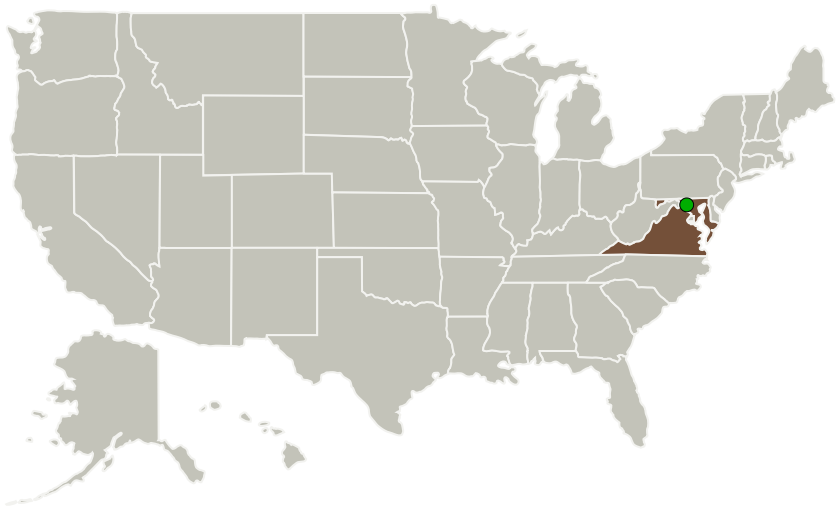
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Virginia Diodes, Inc.	Lead Organization	Industry	Charlottesville, Virginia
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	Virginia

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141062)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Virginia Diodes, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jeffrey L Hesler

Co-Investigator:

Jeffrey Hesler

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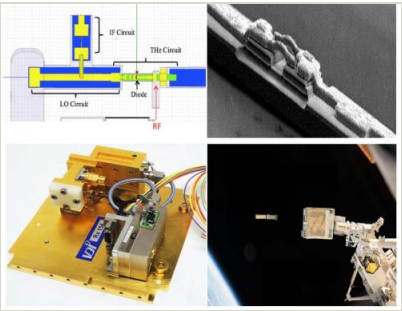
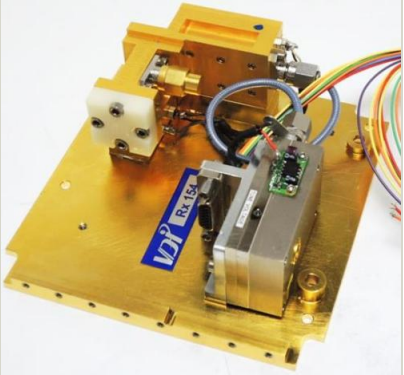
Images



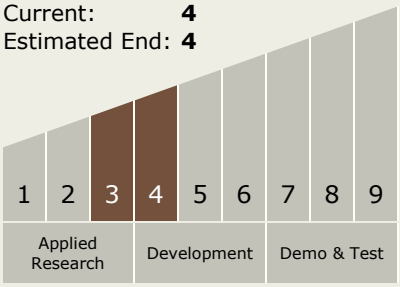
Briefing Chart Image
GaAs Schottky Diode Technology for Terahertz Harmonic Mixers, Phase I
(https://techport.nasa.gov/image/136784)



Final Summary Chart Image
GaAs Schottky Diode Technology for Terahertz Harmonic Mixers, Phase I
(https://techport.nasa.gov/image/134495)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destination

Earth